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ABSTRACT

This study investigated the impact of a "chilly campus climate" on women's first-year cognitive outcomes. The sample population of 1,636 women was selected from incoming first-year students at 18 four-year and five two-year colleges and universities located in 16 different states which had participated in the longitudinal National Study of Student Learning. Institutions were selected from the Integrated Postsecondary Education Data System to approximate the race/sex balance of the national undergraduate population. A "Chilly Climate for Women Scale" was developed from eight items pertaining to perceived gender discrimination on the follow-up study. While the study found modest correlation between chilly campus climate and negative impact on intellectual growth, it did show that the magnitude of the impact was greater for women at two-year colleges than for those at four-year institutions. Four tables provide correlation scales, variable definitions, and regression analyses for women at two-year and at four-year colleges. (Contains 41 references.) (CH)

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THE "CHILLY CLIMATE" FOR WOMEN AND COGNITIVE OUTCOMES DURING THE FIRST YEAR OF COLLEGE*

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held in Memphis, Tennessee, October 31 - November 3, 1996. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Abstract

This study investigated the impact of the "chilly campus climate" for women (Hall & Sandler, 1982; Hall & Sandler, 1984; Sandler, 1986) on women's first-year cognitive outcomes in 23 two- and four-year colleges. Negative relationships were found between perceived chilly climates and women's cognitive growth, although the negative effects were more pronounced for women attending two-year colleges than for their counterparts at four-year institutions.

Introduction

For nearly a decade, women have constituted over half of the undergraduate student population in institutions of higher education in the United States (c.f., Shavlik, Touchton, & Pearson, 1989). Higher education researchers have responded to the presence of increasing numbers of women students by investigating the extent to which women's experiences in college support and/or inhibit their personal and intellectual development. This paper begins with a brief introduction to the research on women's experiences in college, then describes a study of the impact of some of those experiences on women students' learning.

Research on College Outcomes for Women

Research has been conducted on gender differences and gender-related effects of such varied aspects of college as development of self-esteem and educational and vocational aspirations (Arnold, in press; Arnold & Denny, 1985; Holland & Eisenhart, 1990), development of identity (Josselson, 1987; Kaschak, 1992), development of intellectual reasoning (Baxter Magolda, 1988, 1992; Belenky, Clinchy, Goldberger, & Tarule, 1986), course- and major-related learning and participation (Ethington & Wolfle, 1988; Hall & Sandler, 1982: Maher & Tetreault, 1994), leadership development (Astin & Leland, 1991; Whitt, 1994), and general effects of college (Astin, 1993; Astin, 1977). Results of these studies suggest that certain experiences of women in college can have a negative effect on their personal and intellectual development.

Summaries of all this work are not possible here, but we offer one example: the impact on female self-esteem of a variety of socio-cultural aspects of American life (cf.,

American Association of University Women (AAUW), 1992; Mann, 1994; Pipher, 1994). For example, a report of a number of longitudinal studies of girls from childhood through adolescence showed "significant declines in [individuals'] self-esteem and self-confidence." (AAUW, 1992, p. 12). In addition, adolescent girls who have high academic ability have higher expectations for failure and lower self-confidence in new academic settings than boys of similar abilities (AAUW, 1992). Research also indicates that female self-esteem and self-confidence do not improve once women enter college. Although women are likely to come to college with higher grades than men, they have lower expectations for their performance in college (Hafner, 1989). And women's self-esteem apparently continues to decline during their time in college. For example, a longitudinal study of high school valedictorians and salutatorians found that women experienced an acute decline in their estimates of their own intelligence in comparison with that of their peers, despite continued high levels of academic performance (Arnold, in press; Arnold & Denny, 1985). Alexander Astin (1993) echoed this finding in his most recent book, based on his national studies of college students:

> Women enter college already differing considerably from men in self-rated emotional and psychological health, standardized test scores, GPAs, political attitudes, personality characteristics, and career plans, and most of these differences widen during the undergraduate years . . . A similar conclusion was reached nearly twenty years ago in *Four Critical Years*. (p. 405-406)

"Chilly" Campus Climates for Women

The results of these and other studies on college environments for women (Boyer, 1987; Forrest, Hotelling, & Kuk, 1984; Hall & Sandler, 1984; Holland & Eisenhart, 1990; Sandler, 1986; Smith, 1990; Smith, Wolf, & Morrison, 1995; Whitt, 1992; Yeager, 1995; Yeager, Terenzini, Pascarella, & Nora, 1995) suggest that the climates of a large number of coeducational postsecondary institutions are not particularly conducive to, or supportive of, women students' learning.

In 1982, the Association of American Colleges (AAC) Project on the Status and Education of Women published a report entitled, "The Classroom Climate: A Chilly One for Women?" (Hall & Sandler, 1982). In this report, the authors suggested that the climate in coeducational college classrooms was inhospitable for women students as a result of a variety of overt and covert behaviors of faculty and students, including faculty calling on men more than women, faculty and students making stereotypical comments about women's intellectual abilities, and faculty taking men's contributions more seriously than women's.

Ernest Boyer (1987) described this chilly classroom climate in his study of undergraduate education:

> We were especially struck by the subtle, yet significant, differences in the way men and women participated in class . . . In many classrooms, women are overshadowed. Even the brightest women often remain silent . . . Not only do men talk more, but what they say often carries more weight (p. 150).

Hall and Sandler (1984) also identified chilly out-of-class climates for women. These climates are characterized by "micro-inequities" (Hall & Sandler, 1984, p. 4), everyday behaviors that discount or ignore someone on the basis of sex (e.g., sexist humor), as well as institutional policies and practices that discriminate against women, such as inequity in hiring, promotion, and salary decisions (c.f., Chamberlain, 1988; Hensel, 1991), male-dominated academic cultures and traditions (Moore, 1987), and male-dominated student cultures that value men for academic and athletic achievements and women for their attractiveness to men (Holland & Eisenhart, 1990).

The chilly in-class and out-of-class climates encountered by college women reinforce gender stereotypes and demonstrate that women "are outsiders or marginals" in academe (Moore, 1987, p. 30). Astin (1993) posited the effects of this on women students:

> Even though men and women are presumably exposed to a common . . . curriculum and to other common environmental experiences during the undergraduate years, it would seem that their educational programs preserve and strengthen, rather than reduce or weaken, stereotypical differences between men and women in behavior, personality, aspirations, and achievement. (p. 406)

Research Linking the Chilly Climate to College Outcomes

Although the work of Astin, Hall and Sandler, and other researchers cited here suggests that a chilly campus climate exists, it is not clear just exactly what implications such a climate has for the personal and intellectual development of women. Hall and Sandler (1982, 1984) hypothesized that the "chilly climate" reduces the self-confidence

of women and, as a consequence, diminishes their academic and professional aspirations during and after college. Others have hypothesized that elements of the "chilly climate" have impacts beyond women's aspirations, and, in fact, function to inhibit intellectual and personal devlopment druing college (cf., Holland & Eisenhart, 1990; Kuh, Schuh, Whitt, & Associates, 1991; Whitt, 1992).

At the present time, however, there is little or no evidence to support either of these hypotheses. In a multi-institution study of changes in educational aspirations during the first two years of college , Yeager et al (1995) found that a measure of the perceived chilly campus climate for women had a positive net association with increases in educational aspirations -- that is, women students who perceived a chilly campus climate had significantly higher educational aspirations than their counterparts who did not perceive a chilly climate. The study did find, however, that women who perceived a chilly climate were more likely to have higher scores on academic and social integration measures than their peers who did not, and that African American women were more likely to perceive a chilly climate than Caucasian women. Differences between students who perceived a chilly climate and those who did not might account for the counter-intuitive findings of this study.

We know of no research, however, on the impact of the chilly climate on women's intellectual development. The purpose of this study, therefore, was to test the hypothesis that the chilly climate has a negative effect on the cognitive development of women. Research methods used to test the hypothesis are described in the next section; descriptions and discussions of the results of the study follow.

Research Methods

Samples

Institutional Sample

The sample was selected from incoming first-year students at 18 four-year and five two-year colleges and universities located in sixteen different states. These 23 institutions participated in the National Study of Student Learning (NSSL), a longitudinal investigation of the factors that influence learning and cognitive development in college, sponsored by the federally-funded National Center on Postsecondary Teaching, Learning, and Assessment (NCTLA).

Institutions were selected from the National Center on Education Statistics Integrated Postsecondary Education Data System (IPEDS) data base to represent differences in colleges and universities nationwide on a variety of characteristics, including institutional type and form of control (e.g., private and public research universities, private liberal arts colleges, public and private comprehensive universities, two-year colleges, historically black colleges), size, location, proportions of commuter and residential students, and the racial/ethnic distribution of the undergraduate student body. The aggregate student population of the 23 schools approximated the race/ethnicity and sex (male-female) balance of the national population of undergraduates.

Student Sample

Each of the 23 institutions was given a target student sample size relative to the size of the first-year class at each institution. The overall target sample was 5,000 first-

year students; the actual sample for the initial data collection in Fall 1992 was 3,840, a participation rate of 76.8%.

The sample was, to the extent possible, selected at random from among the new students at each of the 23 participating institutions. The students in the sample were informed that they were part of a longitudinal national study of student learning and that they would be paid a stipend for their involvement. They also were told that the information they provided in the study would be anonymous and would never be part of their institutional records.

Follow-up testing of the sample took place in the Spring of 1993. Of the original sample of 3,840 students involved in the Fall 1992 data collection, 2,685 participated in the follow up, a follow-up participation rate of 69.92%. Given the high participation rates at both testing times, it is not particularly surprising that the sample was reasonably representative of the population from which it was drawn. To adjust for potential response bias by sex, race/ethnicity, and institution, however, a sample weighting algorithm was developed. Follow-up participants in each institution were weighted up to the institution's first-year population by sex (male or female) and race/ethnicity (Caucasian, Black, Hispanic, other). Thus, for example, if institution A had 100 Black women in its first-year class, and 25 Black women in the sample, each Black woman in the sample was given a sample weight of 4.00. An analogous weight was computed for participants in each sex x race/ethnicity cell in each institution. Applying sample weights in this manner allowed us to adjust not only for response bias by sex and race/ethnicity, but also for response bias (i.e., differential response rates) by institution.

Data Collection

Initial Data Collection

The initial data collection was conducted in the Fall of 1992, and lasted approximately three hours. Data collected included a precollege survey of student demographic characteristics and background, students' aspirations and expectations of college, and students' orientation toward learning. Participants also completed Form 88A of the Collegiate Assessment of Academic Proficiency (CAAP). The CAAP was developed by the American College Testing Program (ACT) to assess general intellectual skills typically acquired by students during the first two years of college. The CAAP consists of five 40-minute, multiple-choice test modules, three of which – reading comprehension, mathematics, and critical thinking – were administered in the initial data collection. A brief description of each test follows.

The CAAP reading comprehension test is composed of 36 items that assess reading comprehension as a product of skill in inferring, reasoning, and generalizing. The test consists of four 900-word prose passages designed to represent the level and kinds of reading students commonly encounter in college curricula, including topics in fiction, humanities, social sciences, and natural sciences. The KR-20 internal consistency reliability for the reading comprehension test ranges between .84 and .86 (ACT, 1989).

The mathematics test consists of 35 items designed to measure a student's ability to solve mathematical problems. The test emphasizes quantitative reasoning, rather than formula memorization, and includes algebra (four levels), coordinate geometry,

trigonometry, and introductory calculus. The KR-20 reliability coefficients for the mathematics test range between .79 and .81 (ACT, 1989).

The critical thinking test is a 32-item instrument designed to measure a student's ability to clarify, analyze, evaluate, and extend arguments. The test consists of four passages in a variety of formats (e.g., case studies, debates, dialogues, experimental results, statistical arguments, editorials). Each passage contains a series of arguments that support a general conclusion and a set of multiple-choice test items. The KR-20 reliability coefficients for the critical thinking test range between .81 to .82 (ACT, 1989). In a pilot test of instruments for use in the NSSL, the critical thinking test of the CAAP correlated .75 with the total score on the Watson-Glaser Critical Thinking Appraisal (Pascarella, Bohr, Nora, & Terenzini, 1995).

Follow-up Data Collection

Follow-up data collection was conducted in Spring 1993. This data collection took about three and one-half hours, and included Form 88B of the CAAP reading comprehension, mathematics, and critical thinking modules; the College Student Experiences Questionnaire (CSEQ) (Pace, 1984); and a follow-up instrument developed for the NSSL. The CSEQ and the NSSL follow-up instrument were used to measure a wide range of students' curricular and out-of-class experiences in the first year of college.

One part of the CSEQ asked students to indicate how much they felt they had gained or made progress in a variety of aspects of college learning, including science and technology; academic preparation for a career; writing, thinking, and conceptual skills;

and understanding the arts and humanities. These self-reported gains, as well as a composite score of the CAAP modules, were the dependent variables in this study.

Embedded in the NSSL follow-up instrument was a set of eight Likert-type items ("strongly agree" to "strongly disagree") that asked students to indicate the extent to which they had observed or experienced gender discrimination in classroom and non-classroom settings during the first year of college. The items were developed to reflect perceptions of the dimensions of the chilly campus climate described by Hall and Sandler (1982, 1984). An introduction to the items stated:

> Students have different views about their college experiences. On the next seven pages are groups of statements describing those views. Please circle the number on the scale below which indicates your level of agreement or disagreement with each statement. There are no "right" answers here, so please be honest.

A scale formed a priori from the eight items about perceived gender discrimination, named the "Chilly Climate For Women Scale," had an internal consistency reliability of .81. The wording of the items of the scale and the correlation of each item and the total scale are shown in Table 1. This scale constituted the independent variable of primary interest for the study.

Insert Table 1 About Here

Data Analysis

Final Sample

Because the purpose of the study was to determine the impact of the chilly climate on women's cognitive growth during the first year of college, analyses were limited to women in the sample: 1,636 women attending the 23 two- and four-year institutions participating in the NSSL. This sample represented a population of 18,129 first-year women at those institutions.

Analytical Model

The independent variable of primary interest in the study was the "Chilly Climate for Women Scale." The first dependent variable -- of five -- was a composite measure of end-of-first-year cognitive development created by combining the Spring 1993 scores for each student on the CAAP reading comprehension, mathematics, and critical thinking modules. This measure was constructed in two steps. First, each of the three CAAP modules was standardized to put all modules in the same metric. The composite score then was computed by summing across the standardized scores. A composite score provided an objective, standardized estimate of students' intellectual growth during the first year of college. The alpha (internal consistency) reliability for the composite cognitive development measure was .83.

The second set of dependent variables was four factorially-derived scales estimating students' self-reported first-year gains in the following areas: understanding science; academic preparation for a career; writing and thinking skills; and understanding the arts and humanities. Recall that the items constituting each of the four self-reported-

gains scales were taken from the College Student Experiences Questionnaire (Pace, 1984).

Two sets of potentially confounding variables -- individual-level variables and institutional-level variables -- also were included in the analytic model. A number of factors extraneous to the study might influence a woman's cognitive growth during the first year of college, as well as the extent to which she perceives her college climate as "chilly." As a consequence, simple correlations might yield a misleading estimate of the impact of the chilly climate on first-year cognitive development (cf., Feldman, 1994; Pascarella, 1985; Pascarella & Terenzini, 1991).

In selecting individual-level confounding variables, we were guided by evidence on the factors independently influencing learning and cognitive development in college (cf., Astin, 1968, 1977, 1993; Astin & Panos, 1969; Kuh, 1993; Pascarella, 1985; Pascarella & Terenzini, 1991). Individual-level variables incorporated in the analytic model were: precollege (Fall 1992) cognitive development; race/ethnicity (white/non-white); precollege academic motivation; socioeconomic status; total credit hours completed at the end of the first year; hours per week spent studying; on- or off-campus residence; hours employed per week; and the number of courses taken during the first year in social sciences, mathematics, technical/professional, arts and humanities, and natural science and engineering.

Because evidence also suggests that the academic preparation of an institution's student body can influence the climate of an institution (cf., Pascarella & Terenzini, 1991; Yeager et al, 1995), an estimate of student academic preparation was considered an

institutional-level confounding variable. The measure of student academic preparation was estimated with the average precollege (Fall 1992) composite cognitive development score (CAAP reading, math, and critical thinking) for the sample of first-year students (men and women) at each of the 23 institutions. Each woman in the sample was given the mean estimate of academic preparation for her institution, and the institutional mean estimate was used in the analysis of end-of-first-year cognitive development and the four areas of self-reported gains. Operational definitions of all variables in the analyses are shown in Table 2.

Insert Table 2 About Here

Analyses

In the first stage of data analysis, we estimated the net impact of the chilly climate for women on the five first-year cognitive outcomes, applying statistical controls for the potentially confounding variables just identified. Using an ordinary least squares approach, each of the five cognitive outcomes was regressed on all of the potentially confounding influences plus the "Chilly Climate for Women Scale." Preliminary analyses indicated that the net effects of the chilly climate scale differed in magnitude for women at two-year and four-year colleges in the sample; that is, the effects were significantly more negative for women at two-year colleges than their counterparts at four-year institutions.

To determine the precise nature of these differences, separate analyses for two- and four-year institutions were conducted. Weighted samples, adjusted to the actual sample sizes to obtain correct standard errors, were used in all analyses. Because of the large (unweighted) sample size for four-year college women (n=1460), the critical alpha level was set at .01. The relatively small sample of two-year college women (n=176) warranted a more liberal alpha level of .10.

Results

Two-Year College Results

Table 3 illustrates the results of the regression analyses for women attending two-year colleges. As the table indicates, when statistical controls were applied for the fifteen confounding influences, student perceptions of a chilly climate for women, had statistically significant negative effects on three of the five cognitive outcomes: (1) the composite measure of end-of-first-year cognitive development, (2) self-reported gains in academic preparation for a career, and (3) self-reported gains in writing and thinking skills. Two-year college women who perceived chilly campus climates performed significantly less well on the composite measure of cognitive development and reported significantly lower gains in academic preparation for a career and in writing and thinking skills than their peers who perceived less chilly –or not chilly – campus climates for women.

Insert Table 3 About Here

Results for Four-Year College Women

The results of the analyses for women attending four-year colleges and universities are displayed in Table 4. For four-year college women, a perceived chilly campus climate tended to have negative net impacts on the cognitive outcome measures. With the exception of self-reported gains in academic preparation for a career, however, the negative effects were small and statistically non-significant.

Insert Table 4 About Here

Comparison of Two-Year and Four-Year Results

Tables 3 and 4, taken together, provide a vivid comparison between the results for two-year and four-year college women. Using the corresponding unstandardized regression weights from each table, we see that the net negative impact of a chilly climate for women on end-of-first-year cognitive development was nine times stronger for women in two-year colleges than for women in four-year colleges. Also, the negative effects of a chilly climate on self-reported gains in academic preparation for a career and in writing and thinking skills were two and eight times stronger, respectively, for women in two-year institutions.

Conditional Effects

Additional analyses were conducted to determine if the cognitive effects of a chilly climate were general or conditional. That is, were the effects reported in Tables 3 and 4 similar in magnitude for all women in the sample (general effects) or did they differ for different kinds of students (conditional effects)?

To test for the presence of conditional effects, a set of cross-product terms was formed between the "Chilly Climate for Women Scale" and each of the fifteen other confounding variables in the regression model. This set of cross-product terms was added to the general effects regression equations (shown in Tables 3 and 4).

For the four-year college sample, a significant (at .01) increase in explained variance (R^2) associated with the set of cross-product terms would indicate the presence of conditional effects (Pedhazur, 1982). Because of the small size of the two-year college sample, a more liberal criterion was used. Rather than requiring the entire set of cross-products to be associated with a significant R^2 increase, individual cross-product terms significant at $p < .01$ were judged sufficient evidence of the presence of conditional effects.

These analyses revealed no conditional effects for women attending four-year colleges and universities. In all five analyses, the set of cross-products terms was associated with small (less than 1%) and non-significant increases in explained variance. The effects of a chilly climate for women shown in Table 4 appear to be similar in magnitude for students at different levels of the fifteen confounding variables in the regression equation. Thus, the findings that a chilly climate had significant negative

effects on self-reported gains in academic preparation for a career, and small negative effects on general cognitive outcomes, were the same for women in the four-year sample regardless of individual or institutional differences.

The results of the analyses for the two-year college sample yielded generally similar results, but with two exceptions. First, in the analysis of end-of-first-year cognitive development and self-reported gains in writing and thinking skills, there were statistically significant ($p < .01$) conditional effects involving the "Chilly Climate for Women Scale" and precollege cognitive development. To determine the nature of the conditional effects, the two-year sample was divided in half, based on mean scores on precollege cognitive development, and the regression analysis for end-of-first-year cognitive development and writing and thinking gains was repeated.

This analysis revealed a chilly climate had stronger negative effects on end-of-first-year cognitive development for women who entered a two-year college with lower levels of cognitive development (b = -.020, beta = -.232) than women who entered with higher levels of cognitive development (b = -.014, beta = -.137). The opposite, however, was true for self-reported gains in writing and thinking skills: a chilly climate had a stronger negative influence for women who entered a two-year college with higher levels of cognitive development (b = -.023, beta = -.218) than their peers who began with lower levels of cognitive development (b = -.015, beta = -.098). In other words, a chilly climate had a more negative impact on end-of-first-year cognitive development and a less negative impact on self-reported gains in writing and thinking skills for women who

entered a two-year college with lower levels of cognitive development than for women who entered with higher levels of cognitive development.

Discussion

Summary of the Results

The purpose of this study was to test the hypothesis that a chilly campus climate for women would inhibit the cognitive growth of women during the first year of college. Analyses of longitudinal data from 1,636 women attending 23 two- and four-year colleges throughout the country lend at least modest support for the hypothesis. Results demonstrated that perceptions of a chilly campus climate were associated with lower levels of cognitive development, as measured by tests of cognitive growth, and lower levels of self-reported gains in a variety of tasks related to cognitive and curricular aspects of college for women in the sample.

The negative effects of a chilly climate were, however, substantially more pronounced for women attending two-year colleges than for their counterparts at four-year institutions. In the presence of statistical controls for such factors as precollege cognitive development and academic motivation, race, age, socioeconomic status, courses taken, place of residence, employment status, and the average precollege cognitive development of new students at the institution attended, a measure of the chilly campus climate for women had significant negative effects for women at two-year colleges. These effects were present not only on a standardized measure of cognitive development, but also on self-reported gains in academic preparation for a career and in writing and thinking skills.

The corresponding effects of a chilly campus climate for women attending four-year institutions were also negative, but only the effect on self-reported gains in academic preparation for a career was statistically significant.

Additional analyses indicated that the cognitive effects of a chilly climate for four-year college women do not differ for women with different precollege characteristics or who attend institutions that differ in the average cognitive development of incoming students.

In the analyses for two-year college women, however, the extent of the negative effects of a chilly climate differed for women who entered college with different levels of standardized cognitive development. That is, a chilly campus climate had its strongest negative influence on first-year cognitive gains for two-year college women who began postsecondary education with lower levels of cognitive development. The reverse was true for the impact of a chilly climate on two-year college women's self-reported gains in writing and thinking skills. On this outcome, students' perceptions of a chilly climate had their strongest negative effect for women who began college with high levels of cognitive development.

Interpretation of the Results

Two-Year and Four-Year Differences

Although the results of this study suggest modest support for the hypothesis of a negative impact of a chilly campus climate for women on their intellectual growth in college, our data provide little direct explanation for the pronounced difference in the magnitude of the impact for women at two- and four-year institutions. One might

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speculate that the difference can be explained by differences in the extent to which women in two- and four-year colleges perceive a chilly climate. Additional analyses of our data, however, showed no significant differences between two- and four-year college women in average scores on the "Chilly Climate for Women Scale," after we controlled for background characteristics such as academic motivation and precollege cognitive development. There also were no significant differences in the variances of the perceptions of the two-year and four-year women on the chilly climate scale; that is, the range of perceptions of a chilly climate was essentially the same for both groups.

A more plausible explanation for the differences in findings between women attending two- and four-year colleges is the nature of the scale employed to estimate the chilly climate. A review of Table 1 shows that most of the items (five of eight) deal specifically with issues of a chilly academic climate for women; thus, the scale places more emphasis on gender discrimination in classroom settings and academic experiences than in non-classroom settings. It may be that the two-year college women -- most of whom lived off campus -- viewed the climate for women at their institutions largely in terms of what happened in their classrooms and academic programs, and so the scale described a comparatively large part of their college experience.

On the other hand, about 50% of the four-year college sample lived on campus and so, for this group, in-class and academic experiences probably define a smaller part of the institutional climate than for the two-year students (cf., Kuh, 1993; Kuh, Schuh, Whitt, & Associates, 1991; Pascarella & Terenzini, 1991). The cognitive outcomes measured in this study -- overall cognitive growth, thinking and writing skills, understanding science,

arts, and humanities -- could be achieved in a variety of out-of-class or non-academic settings in four-year institutions, including student leadership positions, volunteer work, undergraduate research assistantships, cultural and educational programs, and internships. If the chilly climate scale employed in this study had described a wider range of non-classroom experiences, it is possible that the negative effects for women attending four-year colleges would have been larger.

The chilly climate in four-year colleges had a significant negative effect only on self-reported gains in academic preparation for a career. This finding might reflect the importance the women in the sample placed on interactions with faculty and male peers in classroom and academic settings for career preparation. First-year women students might rely on their experiences in those settings, such as the extent to which their contributions in class are sought and valued, the extent to which their intellectual and career potential is taken seriously by faculty and male classmates, and the extent to which men are given preferential treatment, to assess their progress toward -- and the validity of -- their career goals.

Conditional Effects of the Chilly Climate for Women

Conditional effects of the chilly climate were found for women in two-year colleges. The negative impact of the chilly climate on end-of-first-year cognitive growth was greatest for the women who entered college with lower levels of cognitive development. As the level of precollege cognitive development increased, the negative effects of a chilly campus climate for two-year college women decreased. Therefore, the women who were

most disadvantaged in terms of precollege cognitive development suffered the most from perceived gender discrimination in their institutions.

With regard to self-reported gains in writing and thinking skills, however, the chilly climate had the strongest negative impact on women who began college with high levels of cognitive development. As the level of precollege cognitive development decreased, so, too, did the magnitude of the negative impact of the chilly climate on these gains.

These findings might reflect interaction of differences in the students and in the dependent variables. The measure of cognitive development is an objective measure, whereas gains in thinking and writing skills were self-reported. It might be the case, then, that the two-year college women with higher levels of precollege cognitive development perceived a chillier campus climate than their peers, perceptions that influenced self-reported gains in thinking and writing.

General Effects of the Chilly Climate for Women

We already have indicated that the size of the general negative effects of the chilly campus climate was small. Examination of the standardized (beta) regression weights in Tables 3 and 4 shows that even on those cognitive outcomes where the chilly climate scale had significant negative impacts, the effect ranged between -.10 and -.19 of a standard deviation. That is, when the influence of confounding variables was controlled, one standard deviation increase in the "Chilly Climate for Women" Scale was associated with decreases of between .10 and .19 of a standard deviation in various dimensions of cognitive growth during the first year of college. Such effect sizes are considered modest (Pascarella & Terenzini, 1991).

Weighed against the small effect size, however, are two aspects of this study that ought to be considered when interpreting the results. First, the longitudinal nature of our data allowed us to control for a large number of potentially confounding variables. It is possible that, in doing so, we removed a sizable portion of the variance in cognitive outcomes jointly explained by the chilly climate scale and the other variables in the regression model. Our conservative estimate of the negative effects of the chilly climate might, in fact, underestimate those effects (cf., Pascarella & Terenzini, 1991).

Second, the data analyzed and reported here are for the first year of college only. If we found negative cognitive impacts of the chilly climate after only one year, might we find more pronounced negative effects after longer exposure to that climate? Analyses of second- and third-year NSSL data are planned, and this hypothesis will be tested.

Conclusion

Despite the small size of the significant effects found in this study, our results do show that women students' perceptions of a chilly campus climate have a negative effect on a number of first-year cognitive outcomes. This finding is important for two reasons. First, this study provides some of the first evidence that such effects exist, providing – we hope – impetus to conduct further longitudinal research of about the effects of discrimination against women on women students' learning. Our results make a case for such research to be conducted not only at the national level, as this study was, but also at the institutional level. This study raises potentially important questions about the impact of college environments on college outcomes for women that merit exploration at individual institutions.

Perhaps even more important, the evidence presented here also implies a need for faculty, administrators, and other policy makers to assess the climates for women on their own campuses and take steps to ensure that such climates are not "chilly" -- that they do not inhibit the learning and development of their women students. Any such assessment ought to consider the possibility that a chilly climate for women students might imply a chilly campus climate for all women; some researchers (cf., Chamberlain, 1988; Maher & Tetreault, 1994; Moore, 1987)have asserted that a supportive climate for women students is difficult to achieve in the presence of perceived discrimination against women faculty, administrators, and other staff. Another important consideration for assessment is the possible implications of a chilly climate for women students for the learning and development of men. Finally, the fact that the presence of a chilly climate is noted, and has a negative impact, by the end of the first year of college indicates that assessments and mitigation efforts should occur at the very beginning of students' college experience.

Limitations

The NSSL data have several limitations that should be kept in mind when interpreting these findings. First, although the overall sample is multi-institutional and consists of a broad range of two- and four-year institutions from sixteen states, the fact that the analyses were limited to five two-year and eighteen four-year colleges means that one cannot necessarily generalize the results to all two- and four-year institutions.

Similarly, although we attempted in the initial sampling design and subsequent sample weighting to make the sample as representative as possible at each institution, the time commitments and work required of each student participant led to some self-

selection. The responses of the students who were willing to participate in the study might have differed from those of the students who were invited, but declined, to participate.

Finally, the NSSL analyses conducted for this study area limited by the fact that the sample was traced only over the first year of college. The results reported here might, or might not, hold for subsequent years in college.

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Table 1

ALPHA RELIABILITIES AND ITEM-TOTAL SCORE CORRELATIONS FOR THE "CHILLY CLIMATE FOR WOMEN" SCALE
(All items coded in reverse: 1 = "strongly agree" to 5 = "strongly disagree")

Scale/Item	Item-Total Score Correlation	Alpha Reliability
Chilly Climate for Women		.81
I have never been singled out in class or treated differently than other students because of my gender.	.48	
Few if any of the students in this college are prejudiced against women.	.54	
Instructors treat all students the same whether the student is male or female.	.69	
I have never observed discriminatory words, behaviors, or gestures directed toward female students.	.65	
One seldom hears negative words about women while attending classes.	.63	
This college promotes respect for differences (e.g., racial/ethnic, gender).	.44	
I am treated with respect by faculty at this institution.	.36	
Overall, course content at this institution reflects the experiences of women.	.30	

Table 2
VARIABLE DEFINITIONS

Category/Variable
INDEPENDENT VARIABLES
Precollege (Fall 1992) Cognitive Development: A composite of the reading comprehension, mathematics, and critical thinking modules of Form 88A of the Collegiate Assessment of Academic Proficiency (CAAP), developed by the American College Testing Program; alpha reliability = .83.
Average Student Precollege Cognitive Development at the Institution Attended: Estimated by the average level of precollege cognitive development in the male and female sample of each of the 23 institutions in the study. Each female student was given the mean score of the sample at her institution.
Non-White: 1 = Non-White, 0 = White.
Age: A continuous variable calculated by subtracting year of birth from 1992.
Precollege Academic Motivation: An eight-item, Likert-type scale (5 = "strongly agree" to 1 = "strongly disagree") with an internal consistency reliability of .65. The scale items were based on existing research on academic motivation (e.g., Ball, 1977). Examples of constituent items are: "I am willing to work hard in a course to learn the material, even if it won't lead to a higher grade," "When I do well on a test it is usually because I was well prepared, not because the test was easy," "In high school I frequently did more reading in a class than was required simply because it interested me," and "In high school I frequently talked to my teachers outside of class about ideas presented during class."
Socioeconomic Status: Average of parental education and income.
Total Credit Hours Completed: Number of hours completed during the first year in college.
Average Hours Per Week Spent Studying: Single-item, 6-point self-report of average number of hours spent studying per week, where 1 = none and 6 = more than 20 hours.
On-Campus Residence: 1 = lived on campus, 0 = lived off campus.
Hours Worked Per Week: Combination of average number of hours of on- and off-campus work per week during the school year, coded 1 = none to 9 = more than 35.
Social Sciences Courses Taken: Number of college courses taken in the first year in anthropology, audiology/speech pathology, child and family studies, communications, economics, geography, history, political science, psychology, sociology, or social work.
Mathematics Courses Taken: Number of college courses taken in the first year in pre-algebra, algebra, calculus, statistics, computer science, geometry, matrix algebra, accounting, or business math.
Technical/Professional Courses Taken: Number of college courses taken in the first year in drawing, drafting, architectural design, criminology, education, agriculture, business, physical therapy, pharmacy, physical education, nursing, or computer programming.

Table 2 (continued)

Arts and Humanities Courses Taken: Number of college courses taken in the first year in art history, art appreciation, studio art, dance, theater, music appreciation, music performance, composition or writing, English literature, foreign language, humanities, philosophy, linguistics, classics, or religious studies.

Natural Sciences and Engineering Courses Taken: Number of college courses taken in the first year in astronomy, botany, biology, chemistry, physics, geology, zoology, microbiology, or engineering.

Chilly Climate for Women: An eight-item Likert-type scale (1 = "strongly agree" to 5 = "strongly disagree") assessing students' perceptions of the extent to which the classroom and non-classroom climates of the college discriminate against women; alpha reliability = .81. All items in the scale are shown in Table 1.

DEPENDENT VARIABLES

End-of-First-Year Cognitive Development: A composite of the reading comprehension, mathematics, and critical thinking modules of Form 88B of the Collegiate Assessment of Academic Proficiency (CAAP), developed by the American College Testing Program; alpha reliability = .83.

Self-Reported Gains in Understanding Science: A four-item factorially-derived scale taken from the College Student Experiences Questionnaire (CSEQ) that asks students to indicate how much they have gained or made progress during college in understanding science; alpha reliability = .86. Constituent items were: "understanding the nature of science and experimentation," "understanding new scientific and technical developments," "becoming aware of the consequences (benefits/hazards/dangers/values) of new applications in science and technology," and "quantitative thinking - understanding probabilities, proportions, etc." Coded: 4 = "very much" to 1 = "very little."

Self-Reported Gains in Academic Preparation for a Career: A four-item factorially-derived scale taken from the CSEQ that asks students to indicate how much they have gained or made progress during college in the academic preparation for a career; alpha reliability = .73. Constituent items were: "vocational training - acquiring knowledge and skills applicable to a specific job or type of work," "acquiring background and specialization for further education in some professional, scientific, or scholarly field," "gaining a broad general education about different fields of knowledge," and "gaining a range of information that may be relevant to a career." Coded: 4 = "very much" to 1 = "very little."

Self-Reported Gains in Writing and Thinking Skills: A four-item factorially-derived scale taken from the CSEQ that asks students to indicate how much they have gained or made progress during college in writing and thinking skills; alpha reliability = .77. Constituent items were: "writing clearly and effectively," "ability to think analytically and logically," "ability to put ideas together, to see relationships, similarities, and differences between ideas," and "ability to learn on your own, pursue ideas, and find information you need." Coded: 4 = "very much" to 1 = "very little."

Self-Reported Gains in Understanding the Arts and Humanities: A four-item factorially-derived scale taken from the CSEQ that asks students to indicate how much they have gained or made progress during college in understanding the arts and humanities; alpha reliability = .76. Constituent items were: "developing an understanding and enjoyment of art, music, and drama," "broadening your acquaintance and enjoyment of literature," "becoming aware of different philosophies, cultures, and ways of life," "seeing the importance of history for understanding the present as well as the past," and "gaining knowledge about other parts of the world and other people - Asia, Africa, South America, etc." Coded: 4 = "very much" to 1 = "very little."

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TABLE 3

REGRESSION ANALYSIS SUMMARIES FOR WOMEN AT TWO-YEAR COLLEGES[a]

Predictor	End-of-First-Year Cognitive Development	Gains in Understanding Science	Gains in Academic Preparation for a Career	Gains in Writing and Thinking Skills	Gains in Understanding the Arts and Humanities
Precollege (Fall 1992) Cognitive Development	.281*** (.798)	-.006 (-.017)	-.002 (-.008)	-.024 (-.081)	-.002 (-.008)
Average Student Precollege Cognitive Development at the Institution Attended	.083** (.151)	.012 (.022)	.054 (.112)	.083* (.178)	.154*** (.334)
Non-White	.138 (.090)	.225 (.150)	.148 (.110)	.260** (.199)	.636*** (.492)
Age	.001 (.015)	-.006 (-.017)	.016** (.196)	-.006 (-.079)	-.006 (-.070)
Precollege Academic Motivation	-.069 (-.048)	.399*** (.285)	.221** (.176)	.352*** (.273)	.256** (.213)
Socioeconomic Status	.003 (.009)	-.094*** (-.272)	.020 (.066)	-.016 (-.054)	.020 (.066)
Total Credit Hours Completed	-.000 (-.000)	.098** (.221)	.117*** (.296)	.118*** (.309)	.035 (.092)
Hours Spent Studying	.015 (.027)	-.051 (-.093)	.003 (.006)	-.016 (-.034)	-.038 (-.082)
On-Campus Residence	.064 (.036)	-.011 (-.007)	.066 (.043)	-.045 (-.030)	-.154 (-.103)

(TABLE 3 continued)

Hours Worked per Week	-.001 (-.005)	.010 (.040)	-.003 (-.016)	.001 (.005)	.003 (.013)
Social Science Courses Taken	.006 (.018)	-.016 (-.042)	.017 (.051)	.032 (.099)	.067** (.211)
Mathematics Courses Taken	-.009 (-.014)	.049 (.076)	.058 (.101)	.039 (.069)	-.039 (-.072)
Technical/Preprofessional Courses Taken	.015 (.031)	-.014 (-.030)	.035 (.083)	-.022 (-.054)	.014 (.035)
Arts and Humanities Courses Taken	.019 (.041)	-.039 (-.086)	-.039 (-.098)	-.000 (-.002)	.047* (.124)
Natural Sciences and Engineering Courses Taken	.026 (.025)	.180** (.177)	.052 (.057)	.071 (.080)	-.063 (-.072)
Chilly Climate for Women	-.018*** (-.124)	.016 (.107)	-.025** (-.192)	-.017* (-.137)	-.001 (-.010)
R^2	.752***	.246***	.263***	.183**	.263***

[a]Top number is the unstandardized, metric, regression coefficient; number in parenthesis is the standardized (beta) regression coefficient.

*p < .10
**p < .05
***p < .01

TABLE 4

REGRESSION ANALYSIS SUMMARIES FOR WOMEN AT FOUR-YEAR COLLEGES[a]

Predictor	End-of-First-Year Cognitive Development	Gains in Understanding Science	Gains in Academic Preparation for a Career	Gains in Writing and Thinking skills	Gains in Understan the Arts and Humanities
Precollege (Fall 1992) Cognitive Development	.259** (.797)	-.049** (-.153)	-.006 (-.021)	-.010 (-.039)	-.018 (-.063)
Average Student Precollege Cognitive Development of the Institution Attended	.016 (.051)	.020 (.063)	.015 (.059)	-.023 (-.088)	.005 (.018)
Non-White	-.137** (-.090)	.015 (.010)	-.030 (-.024)	-.082 (-.006)	-.023 (-.017)
Age	-.001 (-.010)	-.013** (-.093)	-.008 (-.072)	-.010** (-.092)	-.005 (-.046)
Precollege Academic Motivation	.014 (.009)	.274** (.187)	.199** (.166)	.270** (.226)	.304** (.239)
Socioeconomic Status	-.004 (-.015)	-.006 (-.019)	-.008 (-.031)	-.006 (-.023)	-.000 (-.000)
Total Credit Hours Completed	.036** (.064)	.021 (.038)	.018 (.038)	.003 (.006)	-.006 (-.012)

(TABLE 4 continued)

Hours Spent Studying	-.016 (-.027)	.027 (.047)	.065** (.138)	.052** (.112)	.033 (.067)
On-Campus Residence	-.051 (-.033)	.049 (.032)	.100 (.081)	.119* (.097)	.082 (.063)
Hours Worked per Week	-.005 (-.019)	.007 (.024)	.000 (.003)	-.016 (-.075)	.000 (.000)
Social Science Courses Taken	.006 (.016)	-.047 (-.123)	.024* (.078)	.031** (.099)	.024* (.073)
Mathematics Courses Taken	.015 (.024)	.010 (.016)	-.043 (-.085)*	-.021 (-.042)	-.067** (-.123)
Technical/Preprofessional Courses Taken	-.029 (-.042)	.009 (.014)	.065** (.115)	.001 (.002)	.016 (.026)
Arts and Humanities Courses Taken	-.004 (-.014)	-.011 (-.035)	.013 (.049)	.019* (.075)	.061** (.221)
Natural Science and Engineering Courses Taken	.011 (.021)	.202** (.386)	.020 (.046)	.005 (.011)	-.012 (-.028)
Chilly Climate for Women	-.002 (-.018)	-.003 (-.019)	-.011* (-.102)	-.002 (-.022)	.002 (.019)
R^2	.769**	.252**	.115**	.108**	.143**

*Top number is the unstandardized, metric, regression coefficient; number in parentheses is the standardized (beta) regression coefficient.

*$p < .01$

**$p < .001$